

Utility Use Case #1
Customer Provides Photovoltaic Based Generation Source
Date 12-15-2009, Version 1.9

1 Descriptions of Function

1.1 Function Name

Customer Provides Photovoltaic Based Generation Source

1.2 Function ID

IECSA identification number of the function

L-11.1.1

1.3 Brief Description

This use case will describe the three tiered approach for a Customer to provide a PV based generations source on the Utility's electric system. A Customer provides a PV based generation source utilizing existing metering technology to 15% of the feeder capacity. This is the baseline. The second scenario will include Advanced Metering Infrastructure (AMI) meters into the installation for up to 15% feeder capacity. The final scenario will discuss how the Utility will work with a Customer to provide PV based generation sources utilizing AMI infrastructure, Home Area Network and two way communicating inverters that are controllable by the Utility to accommodate more than 15% of the feeder capacity. All three scenarios could be in effect at once in any section of the infrastructure.

1.4 Narrative

Until recently distributed generation at the Utility has had an insignificant contribution to the resource portfolio. The state of New Mexico's Renewable Portfolio Standard, enacted in 2006, is starting to drive larger quantities of renewables, and due to the Distributed Generation (DG) carve out, increasing amounts of distributed generation. The "carve out" states that by 2011 1.5% of the 10% renewable energy requirement shall be met with Distributed Generation. This number increases to 3% by 2015 when the total renewable requirement rises from 10 to 15%. These requirements will require a substantial increase in distributed generation, requiring 15MW in 2011, jumping to 45MW of Distributed Generation by 2015.

Of all the Distributed Generation technology options solar PV has the greatest potential and is expected to dominate due to its lower cost, lower projected cost (due to global manufacturing increase), high local and regional insolation, lower installation cost, lack of emissions, abundance of open space and ease of integration. Other Distributed Generation technologies may play a part; but are expected to have a limited impact. Although combined heat and power (CHP) (also known as cogeneration) is an efficient, clean and reliable approach to generating power and thermal energy from a single fuel source; the CHP technologies lack the numerous heat sinks required for this to be an effective Distributed Generation source for the Utility at this time. There are opportunities for small bio mass and land fill applications that may be pursued but they are not expected to contribute near the extent that PV will.

Distributed generation control using either direct inverter control or through an AMI system has challenges and opportunities that should be investigated and defined. Technological advances and economies of scale may increase the penetration of distributed generation resources Distributed Generation in the future. There are several scenarios that should be considered regarding Distributed Generation.

This use case will walk through Customer enrollment in a utility-sponsored Distributed Generation program. Three primary scenarios will be used:

- 1) A Customer provides a PV based generation source utilizing existing metering technology to 15% of the feeder capacity. This is the baseline.
- 2) A Customer provides PV based generation source to 15% of the feeder capacity utilizing AMI.
- 3) A Customer provide PV based generation sources utilizing AMI infrastructure, Home Area Network and two way communicating inverters that are controllable by the Utility to accommodate more than 15% of the feeder capacity.

This use case also explores the utility use of Distributed Generation to help control real and reactive power requirements on the distribution system. In this case, the Customer signs up to allow utility permissive control of Customer Owned Distributed Generation for regulation of real and reactive power. When under contract, the Customer must abide by utility requests or face contractual adjustments. If available, the AMI meter has the capability to support some of the interconnection requirements specified in Tariff, and may be able to help maintain safety of utility personnel during outages and service restoration.

Scenario #1 Customer provides PV based generation source utilizing existing metering technology to 15% of the feeder capacity (baseline)

- In this scenario, the Customer completes the Utility's Solar PV Incentive Program Application and Approval of the Utility's Solar PV Incentive Program Application process. Once accepted the Customer notifies the utility of the intent to connect and energize its Distributed Generation. The utility accepts the Customer Distributed Generation request and completes any installation of additional meters. The utility then informs the Customer that the Distributed Generation unit(s) can be

energized. At this point, the Customer energizes the Distributed Generation unit(s). The Customer need not ever supply net energy to the utility's grid. The utility measures net energy flows in each direction independently.

- Customer may be enrolled in any one of a number of special Distributed Generation incentive programs that require some form of generation output metering for either performance or incentive based compensation.

Scenario #2 Customer provides PV based generation source to 15% of the feeder capacity utilizing AMI

- In this scenario, the Customer completes the Utility's PV Inter Generation agreement. (The generation provided by the Customer is not driving the Distributed Generation on the feeder to exceed 15% of the feeder capacity.) Once accepted the Customer notifies the utility of the intent to connect and energize its Distributed Generation. The utility accepts the Customer Distributed Generation request and completes any installation of additional meters. AMI meters are utilized in this scenario. The utility then informs the Customer that the Distributed Generation unit(s) can be energized. At this point, the Customer energizes the Distributed Generation unit(s). The Customer need not ever supply net energy to the utility's grid. The utility measures net energy flows in each direction independently.
- Customer may be enrolled in any one of a number of special Distributed Generation incentive programs that require some form of generation output metering for either performance or incentive based compensation.

Scenario #3 Customer provides PV based generation sources utilizing AMI infrastructure, Home Area Network and two way communicating inverters that are controllable by the Utility to accommodate more than 15% of the feeder capacity.

- In this scenario, the Customer completes the Utility's Solar PV Incentive Program Application process. The Utility then initiates the aggregation level Distributed Generation application and review process including planning, protection, operations and communications reviews. Application may be accepted, rejected, or accepted with special conditions. The utility accepts the Customer Distributed Generation application and completes any installation of additional equipment and testing/commissioning of the installed equipment including communications. The utility remotely enables the AMI Renewable Energy Credit Meter and establishes remote two way communications to the Customer inverter. At this point, the Utility informs the Customer that it can energize its Distributed Generation unit(s).
- The utility measures net energy flows in each direction independently. The Utility monitors the inverter output and interprets the data for potential actions and advanced applications. Control messages from the utility to the inverter may include disconnect.

1.5 Actor (Stakeholder) Roles

<i>Grouping (Community)</i>		<i>Group Description</i>
<i>Actors Functioning from Customer Premises</i>		<i>Actors that perform their specific functions from the premises of the Customer.</i>
<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
Customer Energy Management System	System	CEMS. Customer owned premise system which interfaces with the Home Area Network and the AMI Premise Interface to provide services for load management and distributed generation. Additionally, may provide the Customer ability to control Customer owned equipment independent of the AMI.
Customer	Person	Residential or small business energy user that has a contract with the utility to receive electrical service from the utility and have a meter installed (possibly an AMI Meter). The Customer may or may not participate in programs provided by the utility including pricing events, load control or distributed generation.
AMI Premise Interface	System	The AMI Premise Interface is one of the communications radios that could be “under glass” of the AMI Meter. (There are two radios built in to the AMI Meter. One is for the AMI System and is a longer range radio. The other is for the AMI Premise Interface and it has a smaller range.) This is the communication resource to the Inverter and the Home Area Network (if available).
Customer Inverter	Device	Equipment at the Customer site belonging to the Customer that can be used for control of Distributed Generation real and reactive power output.
Renewable Energy Credit Meter	Device	REC Meter. Renewable Energy Credit Meter is a revenue grade meter used to measure the energy supplied by Customer Owned Distributed Generation. The Renewable Energy Credit Meter information is recorded and forwarded to the PV Program Manager. This is not an AMI meter.

<i>Grouping (Community)</i>		<i>Group Description</i>
<i>Actors Functioning from Customer Premises</i>		<i>Actors that perform their specific functions from the premises of the Customer.</i>
<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
Net/Billing Meter	Device	Net/Billing Meter is a bi-directional revenue grade meter used to measure energy supplied by the Distributed Generation or used by the Customer. This not an AMI meter.
Customer Owned Distributed Generation	Device	DG. Distributed Generation that the Customer or agent of the Customer owns and operates at its premise.
Home Area Network	System	HAN. Any Customer side automation that can make use of utility signals to affect energy usage within the premises will be considered as the Home Area Network for this project. Home Area Network can affect DER, lighting, security, etc. The Utility will not own Home Area Network.
AMI Net/Billing Meter	Device	AMI Net/Billing Meter is a bi-directional revenue grade meter used to measure energy supplied by the Distributed Generation or used by the Customer. Advanced electric revenue meter capable of two-way communications with the utility. A device that serves as a gateway between the utility, Customer site, and load controllers of the Customer. The meter measures, records, displays, and transmits data such as energy usage, generation, text messages, event logs, etc. to authorized systems (i.e., the AMI Network Management System) and provides other advanced utility functions.
AMI Renewable Energy Credit Meter	Device	AMI REC Meter. AMI Renewable Energy Credit Meter is a revenue grade meter used to measure the energy supplied by Customer Owned Distributed Generation. The Renewable Energy Credit Meter information is recorded and forwarded to the PV Program Manager. Advanced electric revenue meter capable of two-way communications with the utility. A device that serves as a gateway between the utility, Customer site, and load controllers of the Customer. The meter measures, records, displays, and transmits data such as energy usage, generation, text

<i>Grouping (Community)</i>		<i>Group Description</i>
<i>Actors Functioning from Customer Premises</i>		<i>Actors that perform their specific functions from the premises of the Customer.</i>
<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
		messages, event logs, etc. to authorized systems (i.e., the AMI Network Management System) and provides other advanced utility functions.

<i>Grouping (Community)</i>		<i>Group Description</i>
<i>The Utility Actors</i>		<i>Actors that perform their specific functions as a part of the Utility</i>
<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
The Utility	System	Host utility.
Meter Data Management System	System	MDMS. System that gathers, validates, estimates and permits editing of meter data such as energy usage, generation, and meter logs. It stores this data for a limited amount of time before it goes to a data warehouse (Meter Data Archive), and makes this data available to authorized systems and authorized personnel.
Distributed Resource Availability and Control System	System	DRAACS. System and subsystems responsible for maintaining an estimate, with a known precision, of how much resource is available for dispatch. Distributed Resource Availability and Control System is also responsible for accepting requests for blocks of energy and/or capacity and implementing that request by issuing load control requests. Distributed Resource Availability and Control System contains an optimization function that can determine the optimal Customer set to request curtailment from based upon a variety of factors/parameters, including the size and location of the desired Demand Response (DR) resource. Distributed Resource Availability and Control System is expected to track the "as implemented" response

<i>Grouping (Community)</i>		<i>Group Description</i>
<i>The Utility Actors</i>		<i>Actors that perform their specific functions as a part of the Utility</i>
<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
		to load control requests and issue additional load reduction requests to selected Customer sets until authorized load reduction target is met. Distributed Resource Availability and Control System uses measured responses to load demand requests to refine its internal model. Note: Any Distributed Resource Availability and Control System in use today may be parts of other systems being used. No platform exists to bring it into an operational tool today.
Grid Control Center	System	GCC. The Grid Control Center controls grid operations through the Energy Management System, SCADA and Distribution Management System in the control area. The Grid Control Center will communicate to grid operators to ensure grid reliability and also sends signals.
Customer Information System	System	CIS. Maintains Customer contact information, calculates and formats Customer bills, receives, and applies payments for individual accounts. The system is responsible for storing Customer information such as site data, meter number, rates, and program participation.
Customer Service Representative	Person	CSR. Staff employed by the utility who respond to Customer complaints, to outage notifications, or to Customer requests to activate, modify and/or terminate delivery of service. Customer Service Representatives also enroll a Customer in utility sponsored programs and answer questions related to the energy consumption and cost data of the Customer. Many off-cycle reading, billing, work orders and diagnostics requests are initiated by the Customer Service Representative in response to Customer contact.
AMI Network Management System	System	AMI NMS. AMI Network Management System is the utility back office system that is responsible for remote two-way communications with the AMI Meters to retrieve data and execute commands. The AMI Network Management System has the

<i>Grouping (Community)</i>		<i>Group Description</i>
<i>The Utility Actors</i>		<i>Actors that perform their specific functions as a part of the Utility</i>
<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
		responsibility to balance load on the communications network resulting from scheduled meter reads and to retry meters when communications fail. AMI Network Management System is the component responsible for monitoring the health of the AMI system, managing and implementing remote firmware updates, configuration changes, provisioning functions, control and diagnostics.
PV Program Manager	Person	Person or department responsible for administering the retail solar program.
Distribution Management System	System	DMS. A system that integrates the functions of SCADA, outage management, work management, distribution load management, reactive control, and asset management into a single console and set of applications.
Metering Department	Person	The Utility Metering Department. Performs metering installations, testing and verification.
Outage Management System	System	OMS. A combination of the Outage Management System and the Trouble Management System
AMI	System	Advanced Metering Infrastructure. Advanced electric revenue metering system capable of two-way communications between the Customer and the utility. A device that serves as a gateway (AMI Premise Interface) between the utility, Customer site, and load controllers of the Customer. The meter measures, records, displays, and transmits data such as energy usage, generation, text messages, event logs, etc. to authorized systems (i.e., the AMI Network Management System) and provides other advanced utility functions..
Distribution Operator	Person	DO. Operating over the distribution system, using SCADA and Distribution Management System to make decisions concerning the distribution grid.

1.6 Information exchanged

Describe any information exchanged in this template.

<i>Information Object Name</i>	<i>Information Object Description</i>
The Utility's Solar PV Incentive Program Application	Application available on the Utility's Website for the Customer to complete when they are interested in enrolling in the Solar PV Incentive Program.
Approval of the Utility's Solar PV Incentive Program Application	Approval of the Customer Application for the Customer to complete when they are interested in enrolling in the Solar PV Incentive Program.
Installation Phase	Installation phase of the Customer PV System.
Completed PV Installation	Completion of the installation of the Customer PV System.
Customer PV Installation Information	Equipment and Account Information for the Customer PV Installation
Net/Billing Meter Information	Meter information for a specific Net/Billing Meter
Renewable Energy Credit Meter Information	Meter information for a specific Renewable Energy Credit Meter
Net/Billing Meter Data	Meter data for a specific Net/Billing Meter. This data includes voltage, current and power quality parameters.
Renewable Energy Credit Metering Data	Meter data for a specific Renewable Energy Credit Meter. This data includes voltage, current and power quality parameters.
Renewable Energy Credit Meter Data, Net/Billing Meter (if necessary) Data and Customer account information	Meter data for a specific Renewable Energy Credit Meter, specific Net/Billing Meter and specific Customer account information.
OK to begin generation	The verification for the Customer to begin generation with their PV System.

<i>Information Object Name</i>	<i>Information Object Description</i>
AMI Net/Billing Meter Information and AMI Renewable Energy Credit Meter Information	AMI Meter information for a specific Net/Billing Meter and specific AMI Renewable Energy Credit Meter
AMI Renewable Energy Credit Meter Information	Meter information for a specific AMI Renewable Energy Credit Meter
AMI Net/Billing Meter Information	Meter information for a specific AMI Net/Billing Meter
AMI Renewable Energy Credit Meter Information, AMI Billing/Net Information and Meter Enabling Commands	AMI Meter information for a specific Net/Billing Meter, specific Renewable Energy Credit Meter and enabling commands to allow the specific meters to join the AMI Meter Communication Backbone.
AMI Billing/Net Information and Meter Enabling Commands	AMI Meter information for a specific Net/Billing Meter and enabling commands to allow the specific meter to join the AMI Meter Communication Backbone.
AMI Renewable Energy Credit Meter Read Request	A request for a Renewable Energy Credit Meter Read
Customer Account Information	Account Information for a specific Customer
AMI Renewable Energy Credit Meter Data	Meter data for a specific AMI Renewable Energy Credit Meter. This data includes voltage, current and power quality parameters.
Customer Inverter Information	Information for a specific Customer Inverter
Communication Request for the Customer Inverter	Request for two-way communications between the Distribution Management System and the Customer Inverter
Communications Acknowledgement Signal	Acknowledgment Signal from the Customer Inverter acknowledging a successful communications request.
General Query to Update System	General Query to update the status of the System Equipment.

<i>Information Object Name</i>	<i>Information Object Description</i>
Equipment Information	
Successful Communications	Successful two-way communications from the Distribution Management System to the Customer Inverter and back

1.7 Activities/Services

Describe or list the activities and services involved in this Function (in the context of this Function). An activity or service can be provided by a computer system, a set of applications, or manual procedures. These activities/services should be described at an appropriate level, with the understanding that sub-activities and services should be described if they are important for operational issues, automation needs, and implementation reasons. Other sub-activities/services could be left for later analysis.

<i>Activity/Service Name</i>	<i>Activities/Services Provided</i>

1.8 Contracts/Regulations

<i>Contract/Regulation</i>	<i>Impact of Contract/Regulation on Function</i>
Customer Distributed Generation Service Contract	No Customer can operate on the Utility's system in a manner that is detrimental to the Utility or another Customer.

<i>Policy</i>	<i>From Actor</i>	<i>May</i>	<i>Shall Not</i>	<i>Shall</i>	<i>Description (verb)</i>	<i>To Actor</i>

<i>Constraint</i>	<i>Type</i>	<i>Description</i>	<i>Applies to</i>

2 Step by Step Analysis of Function

2.1 Steps to implement function – Scenario 1 PV based generation source utilizing existing metering technology

Scenario 1 PV based generation source utilizing existing metering technology

2.1.1 Preconditions and Assumptions

Describe conditions that must exist prior to the initiation of the Function, such as prior state of the actors and activities

Identify any assumptions, such as what systems already exist, what contractual relations exist, and what configurations of systems are probably in place

Identify any initial states of information exchanged in the steps in the next section. For example, if a purchase order is exchanged in an activity, its precondition to the activity might be 'filled in but unapproved'.

<i>Actor/System/Information/Contract</i>	<i>Preconditions or Assumptions</i>
Customer	The feeder penetration is 15% or less penetration.
The Utility	Storage is not addressed in this use case.
Customer	Customer can generate more than they consume (excess generator).
Customer	No AMI Meter.
Customer	Customer has received usage information and performed analysis of selected PV design. Assume Customer has researched their own feasibility, usage data, cost, payback, vendors etc and made their key decisions and has/plans to install approvable system.
Customer	Max capacity is based on inverter size (not PV capacity).
Customer	Customer PV application process is already on the Utility's website.

<i>Actor/System/Information/Contract</i>	<i>Preconditions or Assumptions</i>
Customer	Customer has installation plans and secured all the required permits.
Customer	Distributed Generation interconnection process is accessible on the Utility's website.
Customer	A tariff will likely be needed to support the scenario along with associated Customer agreements.

2.1.2 Steps

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
#	<i>Triggering event? Identify the name of the event</i>	<i>What other actors are primarily responsible for the Process/Activity? Actors are defined in section 1.5.</i>	<i>Label that would appear in a process diagram. Use action verbs when naming activity.</i>	<i>Describe the actions that take place in active and present tense. The step should be a descriptive noun/verb phrase that portrays an outline summary of the step. "If ...Then...Else" scenarios can be captured as multiple Actions or as separate steps.</i>	<i>What other actors are primarily responsible for Producing the information? Actors are defined in section 1.5.</i>	<i>What other actors are primarily responsible for Receiving the information? Actors are defined in section 1.5. (Note – May leave blank if same as Primary Actor)</i>	<i>Name of the information object. Information objects are defined in section 1.6</i>	<i>Elaborate architectural issues using attached spreadsheet . Use this column to elaborate details that aren't captured in the spreadsheet .</i>	<i>Reference the applicable IECSA Environment containing this data exchange. Only one environment per step.</i>

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
1.1	Customer indicates the desire to begin the process with the Utility to install a Customer owned PV System that will be tied into the Utility's electric grid.	Customer	Submits the Utility's Solar PV Incentive Program Application	Customer completes the Utility's Solar PV Incentive Program Application available from the Utility's website and submits the Utility's Solar PV Incentive Program Application to the PV Program Manager.	Customer	PV Program Manager	The Utility's Solar PV Incentive Program Application		
1.1.1	PV Program Manager reviews the Utility's Solar PV Incentive Program Application of the Customer	PV Program Manager	PV Program Manager reviews the Utility's Solar PV Incentive Program Application of the Customer	PV Program Manager reviews the Utility's Solar PV Incentive Program Application of the Customer and the potential Distributed Generation percentage threshold for the feeder in question.	PV Program Manager	PV Program Manager	The Utility's Solar PV Incentive Program Application		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
1.1.2	PV Program Manager notifies Customer	PV Program Manager	PV Program Manager notifies Customer	PV Program Manager notifies Customer of Approval of their Utility's Solar PV Incentive Program Application.	PV Program Manager	Customer	Approval of the Utility's Solar PV Incentive Program Application		
1.1.3	Customer begins installation	Customer	Customer begins installation	Customer begins their PV installation process.	Customer	Customer	Installation Phase		
1.1.4	Completed Installation	Customer	Completed Installation	Customer notifies PV Program Manager concerning their completed PV installation.	Customer	PV Program Manager	Completed PV Installation		
1.2	Contact Metering Department	PV Program Manager	Contact Metering Department	PV Program Manager contacts the Metering Department with the Customer PV Installation Information.	PV Program Manager	Metering Department	Customer PV Installation Information		
1.2.1	Electrical inspection	Metering Department	Electrical inspection	The Metering Department performs electrical inspection of Customer installation.	Metering Department	Metering Department	Customer PV Installation Information		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
1.2.2	Installs Net/Billing Meter	Metering Department	Installs Net/Billing Meter	The Metering Department installs Net/Billing Meter (if necessary).	Net/Billing Meter	Metering Department	Net/Billing Meter Information		
1.2.3	Installs Renewable Energy Credit Meter	Metering Department	Installs Renewable Energy Credit Meter	The Metering Department installs Renewable Energy Credit Meter.	Renewable Energy Credit Meter	Metering Department	Renewable Energy Credit Meter Information		
1.2.4	Reads Net/Billing Meter	Metering Department	Reads Net/Billing Meter	The Metering Department reads the Net/Billing Meter (if necessary).	Net/Billing Meter	Metering Department	Net/Billing Meter Data		
1.2.5	Renewable Energy Credit Meter data	Metering Department	Renewable Energy Credit Meter data	The Metering Department reads Renewable Energy Credit Meter.	Metering Department	Renewable Energy Credit Meter	Renewable Energy Credit Metering Data		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
1.2.6	Sends metering data and account information	Metering Department	Sends metering data and account information	The Metering Department sends Renewable Energy Credit Meter, Net/Billing Meter (if necessary) Data and Customer account information to the PV Program Manager.	Metering Department	PV Program Manager	Renewable Energy Credit Meter Data, Net/Billing Meter (if necessary) Data and Customer account information		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
1.3	Enter Account Information	PV Program Manager	Enter Account Information	PV Program Manager enters the Renewable Energy Credit Meter Data, Net/Billing Meter (if necessary) Data and Customer account information into the Customer Information Service.	PV Program Manager	Customer Information Service	Renewable Energy Credit Meter Data, Net/Billing Meter (if necessary) Data and Customer account information		
1.4	Customer receives O.K.	PV Program Manager	Customer receives O.K.	PV Program Manager notifies Customer of O.K. to begin generation.	PV Program Manager	Customer	OK to begin generation		

2.1.3 Post-conditions and Significant Results

<i>Actor/Activity</i>	<i>Post-conditions Description and Results</i>
Customer	Customer may now generate energy for their own use or to be supplied to the grid with their PV installation. The Customer may be able to sign up for additional solar programs from the Utility that could be financially beneficial to the Customer.

2.2 Steps to implement function - Scenario 2 PV based generation source to 15% of the feeder capacity utilizing AMI

Scenario 2 PV based generation source to 15% of the feeder capacity utilizing AMI

2.2.1 Preconditions and Assumptions

<i>Actor/System/Information/Contract</i>	<i>Preconditions or Assumptions</i>
The Utility	There is a functioning AMI infrastructure in place with communications to PV Installation.
Customer	No Home Area Network included in this scenario.
Customer	Customer has received usage information and performed analysis of selected PV design. Assume Customer has researched their own feasibility, usage data, cost, payback, vendors etc and made their key decisions and has/plans to install approvable system.
Customer	Max capacity is based on inverter size (not PV capacity).
Customer	Customer PV the Utility's Solar PV Incentive Program Application process is already on the Utility's website.
Customer	Customer has installation plans and secured all the required permits.
Customer	Distributed Generation interconnection process is accessible on the Utility's website.
The Utility	The feeder penetration is 15% or less penetration.
Customer	A tariff will likely be needed to support the scenario along with associated Customer agreements.

2.2.2 Steps

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environment s
#	Triggering event? Identify the name of the event	What other actors are primarily responsible for the Process/Activity? Actors are defined in section 1.5.	Label that would appear in a process diagram. Use action verbs when naming activity.	Describe the actions that take place in active and present tense. The step should be a descriptive noun/verb phrase that portrays an outline summary of the step. "If...Then...Else" scenarios can be captured as multiple Actions or as separate steps.	What other actors are primarily responsible for Producing the information? Actors are defined in section 1.5.	What other actors are primarily responsible for Receiving the information? Actors are defined in section 1.5. (Note – May leave blank if same as Primary Actor)	Name of the information object. Information objects are defined in section 1.6	Elaborate architectural issues using attached spreadsheet. Use this column to elaborate details that aren't captured in the spreadsheet.	Reference the applicable IECSEA Environment containing this data exchange. Only one environment per step.

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
2.1	Customer indicates the desire to begin the process with the Utility to install a Customer owned PV System that will be tied into the Utility's electric grid.	Customer	Submits the Utility's Solar PV Incentive Program Application	Customer completes the Utility's Solar PV Incentive Program Application available from the Utility's website and submits Utility's Solar PV Incentive Program Application to the PV Program Manager.	Customer	PV Program Manager	The Utility's Solar PV Incentive Program Application		
2.1.1	PV Program Manager reviews the Utility's Solar PV Incentive Program Application of the Customer	PV Program Manager	PV Program Manager reviews the Utility's Solar PV Incentive Program Application of the Customer	PV Program Manager reviews the Utility's Solar PV Incentive Program Application of the Customer and the potential Distributed Generation percentage threshold for the feeder in question.	PV Program Manager	PV Program Manager	The Utility's Solar PV Incentive Program Application		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
2.1.2	PV Program Manager notifies Customer	PV Program Manager	PV Program Manager notifies Customer	PV Program Manager notifies Customer of Approval of their Utility's Solar PV Incentive Program Application.	PV Program Manager	Customer	Approval of the Utility's Solar PV Incentive Program Application		
2.1.3	Customer begins installation	Customer	Customer begins installation	Customer begins their PV installation process.	Customer	Customer	Installation Phase		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
2.1.4	Completed Installation	Customer	Completed Installation	Customer notifies PV Program Manager concerning their completed PV installation.	Customer	PV Program Manager	Completed PV Installation		
2.2	Contact Metering Department	PV Program Manager	Contact Metering Department	PV Program Manager contacts the Metering Department with the Customer PV Installation Information.	PV Program Manager	Metering Department	Customer PV Installation Information		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
2.2.1	Entering Meter Information	Metering Department	Entering Meter Information	The Metering Department enters AMI Net/Billing Meter and AMI Renewable Energy Credit Meter information into the Meter Data Management System	Metering Department	Meter Data Management System	AMI Net/Billing Meter Information and AMI Renewable Energy Credit Meter Information		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
2.2.2	Electrical Inspection	Metering Department	Electrical Inspection	The Metering Department performs electrical inspection of Customer installation.	Metering Department	Customer	Customer PV Installation Information		
2.2.3	Install AMI Renewable Energy Credit Meter	Metering Department	Install AMI Renewable Energy Credit Meter	The Metering Department installs AMI Renewable Energy Credit Meter.	AMI Renewable Energy Credit Meter	Metering Department	AMI Renewable Energy Credit Meter Information		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
2.2.4	Install AMI Net/Billing Meter	Metering Department	Install AMI Net/Billing Meter	The Metering Department installs AMI Net/Billing Meter.	AMI Net/Billing Meter	Metering Department	AMI Net/Billing Meter Information	This meter may be the same meter as the Renewable Energy Credit Meter.	

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
2.3	Deliver Meter Information	Meter Data Management System	Deliver Meter Information	The Meter Data Management System delivers AMI Renewable Energy Credit Meter Information, AMI Billing/Net Information and Meter Enabling Commands to the AMI Network Management System	Meter Data Management System	AMI Network Management System	AMI Renewable Energy Credit Meter Information, AMI Billing/Net Information and Meter Enabling Commands		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
2.3.1 A	Enabled AMI Renewable Energy Credit Meter	AMI Network Management System	Enabled AMI Renewable Energy Credit Meter	AMI Network Management System communicates to and enables the AMI Renewable Energy Credit Meter via the AMI Infrastructure.	AMI Network Management System	AMI Renewable Energy Credit Meter	AMI Renewable Energy Credit Meter Information, AMI Billing/Net Information and Meter Enabling Commands	Enabling allows the meter to become part of the communication backbone.	

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
2.3.1 B	Enabled AMI Net/Billing Meter	AMI Network Management System	Enabled AMI Net/Billing Meter	AMI Network Management System communicates to and enables the AMI Net/Billing Meter via the AMI Infrastructure.	AMI Network Management System	AMI Net/Billing Meter	AMI Billing/Net Information and Meter Enabling Commands	Enabling allows the meter to become part of the communication backbone.	

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
2.4.1	Read Renewable Energy Credit Meter	AMI Meter Data Management System	Read Renewable Energy Credit Meter	AMI Meter Data Management System requests a meter read from the AMI Renewable Energy Credit Meter via the AMI Network Management System	AMI Meter Data Management System	AMI Network Management System	AMI Renewable Energy Credit Meter Read Request		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environment
2.4.1.1	Read Renewable Energy Credit Meter	AMI Network Management System	Read Renewable Energy Credit Meter	AMI Network Management System requests a meter read from the AMI Renewable Energy Credit Meter.	AMI Network Management System	AMI Renewable Energy Credit Meter	AMI Renewable Energy Credit Meter Read Request		
2.4.1.2	AMI Renewable Energy Credit Meter Data to AMI Network Management System	AMI Renewable Energy Credit Meter	AMI Renewable Energy Credit Meter Data to AMI Network Management System	AMI Renewable Energy Credit Meter delivers AMI Renewable Energy Credit Meter Data to the AMI Network Management System	AMI Renewable Energy Credit Meter	AMI Network Management System	AMI Renewable Energy Credit Meter Data		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environment
2.4.1.3	AMI Renewable Energy Credit Meter Data to Meter Data Management System	Meter Data Management System	AMI Renewable Energy Credit Meter Data to Meter Data Management System	The Meter Data Management System receives the AMI Renewable Energy Credit Meter Data from the AMI Network Management System	AMI Renewable Energy Credit Meter	Meter Data Management System	AMI Renewable Energy Credit Meter Data		
2.5	Enter Customer Account Information	PV Program Manager	Enter Customer Account Information	PV Program Provider enters the Customer Account Information into the Customer Information Service.	PV Program Manager	Customer Information System	Customer Account Information		
2.6	Customer receives O.K.	PV Program Manager	Customer receives O.K.	PV Program Manager notifies Customer that it is OK to begin generation.	PV Program Manager	Customer	OK to begin generation		

2.2.3 Post-conditions and Significant Results

<i>Actor/Activity</i>	<i>Post-conditions Description and Results</i>
Customer	Customer may now generate energy for their own use or to be supplied to the grid with their PV installation. The Customer may be able to sign up for additional solar programs from the Utility that could be financially beneficial to the Customer.
The Utility	The Utility can remotely monitor the output from the Customer PV Installation. This will enable the Utility to more accurately view the performance of the Distributed Generation installations on the Utility's grid.

2.3 Steps to implement function - Scenario 3 PV based generation sources utilizing AMI infrastructure, Home Area Network and two way communicating inverters

Scenario 3 PV based generation sources utilizing AMI infrastructure, Home Area Network and two way communicating inverters

2.3.1 Preconditions and Assumptions

<i>Actor/System/Information/Contract</i>	<i>Preconditions or Assumptions</i>
Customer	Inverters have to be communicating (two-way) and must be able to communicate with the Utility's Premise Interface system.
The Utility	The Utility has a PV/DG application review process based including aggregation limitation models.
The Utility	Renewable cost threshold is not exceeded.
Customer	Customer need not ever supply net energy to the utility's grid.
The Utility	This isn't a micro-grid that would need to initiate the start of a large motor in an island situation? e.g. "Black Start".
Customer	Customer may or may not have a Customer Energy Management System
Customer	Home Area Network and AMI Premise Interface exist.
Customer	Home Area Network and/or Customer Energy Management System does <u>not</u> have control of the Customer Inverter. It may receive status information from the Customer Inverter.
The Utility	The Utility has an aggregation level Distributed Generation application and review process.
The Utility	A tariff will likely be needed to support the scenario along with associated Customer agreements.

<i>Actor/System/Information/Contract</i>	<i>Preconditions or Assumptions</i>
Customer	There is a functioning AMI infrastructure in place with communications to PV installations.
The Utility	No storage is addressed in this use case.
The Utility	NERC CIP requirements do not apply.
Customer	The Renewable Energy Credit Meter (AMI meter) can be controlled separately. This would be a fail-safe to turn off the PV input if needed. Could also be needed to stabilize the systems.
Customer	Inverter controls go from the utility through the AMI Premise Interface.
Customer	The AMI Premise Interface could be in a meter.
Customer	Customer has received usage information and performed analysis of selected PV design. Assume Customer has researched their own feasibility, usage data, cost, payback, vendors etc and made their key decisions and has/plans to install approvable system.
Customer	Max capacity is based on inverter size (not PV capacity).
Customer	Customer PV application process is already on the Utility's website.
Customer	Customer has installation plans and secured all the required permits.
Customer	Distributed Generation interconnection process is accessible on the Utility's website.
The Utility	Distribution Operator is responsible for initiating Customer Inverter commands via the Distribution Management System

2.3.2 Steps

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environment s
#	<i>Triggering event? Identify the name of the event</i>	<i>What other actors are primarily responsible for the Process/Activity? Actors are defined in section 1.5.</i>	<i>Label that would appear in a process diagram. Use action verbs when naming activity.</i>	<i>Describe the actions that take place in active and present tense. The step should be a descriptive noun/verb phrase that portrays an outline summary of the step. "If ...Then...Else" scenarios can be captured as multiple Actions or as separate steps.</i>	<i>What other actors are primarily responsible for Producing the information? Actors are defined in section 1.5.</i>	<i>What other actors are primarily responsible for Receiving the information? Actors are defined in section 1.5. (Note – May leave blank if same as Primary Actor)</i>	<i>Name of the information object. Information objects are defined in section 1.6</i>	<i>Elaborate architectural issues using attached spreadsheet. Use this column to elaborate details that aren't captured in the spreadsheet</i>	<i>Reference the applicable IECSA Environment containing this data exchange. Only one environment per step.</i>

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.1	Customer indicates the desire to begin the process with the Utility to install a Customer owned PV System that will be tied into the Utility electric grid.	Customer	Submits the Utility's Solar PV Incentive Program Application	Customer completes the Utility's Solar PV Incentive Program Application available from the Utility's website and submits Utility's Solar PV Incentive Program Application to the PV Program Manager.	Customer	PV Program Manager	The Utility's Solar PV Incentive Program Application		
3.1.1	PV Program Manager reviews the Utility's Solar PV Incentive Program Application of the Customer	PV Program Manager	PV Program Manager reviews the Utility's Solar PV Incentive Program Application of the Customer	PV Program Manager reviews the Utility's Solar PV Incentive Program Application of the Customer and the potential Distributed Generation percentage threshold for the feeder in question.	PV Program Manager	PV Program Manager	The Utility's Solar PV Incentive Program Application		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.1.2	PV Program Manager notifies Customer	PV Program Manager	PV Program Manager notifies Customer	PV Program Manager notifies Customer of Approval of their Utility's Solar PV Incentive Program Application.	PV Program Manager	Customer	Approval of the Utility's Solar PV Incentive Program Application		
3.1.3	Customer begins installation	Customer	Customer begins installation	Customer begins their PV installation process.	Customer	Customer	Installation Phase		
3.1.4	Completed Installation	Customer	Completed Installation	Customer notifies PV Program Manager concerning their completed PV installation.	Customer	PV Program Manager	Completed PV Installation		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.2	Contact Metering Department	PV Program Manager	Contact Metering Department	PV Program Manager contacts the Metering Department with the Customer PV Installation Information.	PV Program Manager	Metering Department	Customer PV Installation Information		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.2.1	Entering Meter Information	Metering Department	Entering Meter Information	The Metering Department enters AMI Net/Billing Meter and AMI Renewable Energy Credit Meter information into the Meter Data Management System	Metering Department	Meter Data Management System	AMI Net/Billing Meter Information and AMI Renewable Energy Credit Meter Information		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.2.2	Electrical Inspection	Metering Department	Electrical Inspection	The Metering Department performs electrical inspection of Customer installation.	Metering Department	Customer	Customer PV Installation Information		
3.2.3	Install AMI Renewable Energy Credit Meter	Metering Department	Install AMI Renewable Energy Credit Meter	The Metering Department installs AMI Renewable Energy Credit Meter.	AMI Renewable Energy Credit Meter	Metering Department	AMI Renewable Energy Credit Meter Information		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environment
3.2.4	Install AMI Net/Billing Meter	Metering Department	Install AMI Net/Billing Meter	The Metering Department installs AMI Net/Billing Meter.	AMI Net/Billing Meter	Metering Department	AMI Net/Billing Meter Information	This meter may be the same meter as the Renewable Energy Credit Meter.	

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.3	Deliver Meter Information	Meter Data Management System	Deliver Meter Information	The Meter Data Management System delivers AMI Renewable Energy Credit Meter Information, AMI Billing/Net Information and Meter Enabling Commands to the AMI Network Management System	Meter Data Management System	AMI Network Management System	AMI Renewable Energy Credit Meter Information, AMI Billing/Net Information and Meter Enabling Commands		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.3.1 A	Enabled AMI Renewable Energy Credit Meter	AMI Network Management System	Enabled AMI Renewable Energy Credit Meter	AMI Network Management System communicates to and enables the AMI Renewable Energy Credit Meter via the AMI Infrastructure.	AMI Network Management System	AMI Renewable Energy Credit Meter	AMI Renewable Energy Credit Meter Information, AMI Billing/Net Information and Meter Enabling Commands	Enabling allows the meter to become part of the communication backbone.	

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.3.1 B	Enabled AMI Net/Billing Meter	AMI Network Management System	Enabled AMI Net/Billing Meter	AMI Network Management System communicates to and enables the AMI Net/Billing Meter via the AMI Infrastructure.	AMI Network Management System	AMI Net/Billing Meter	AMI Billing/Net Information and Meter Enabling Commands	Enabling allows the meter to become part of the communication backbone.	

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.4.1	Read Renewable Energy Credit Meter	AMI Meter Data Management System	Read Renewable Energy Credit Meter	AMI Meter Data Management System requests a meter read from the AMI Renewable Energy Credit Meter via the AMI Network Management System	AMI Meter Data Management System	AMI Network Management System	AMI Renewable Energy Credit Meter Read Request		
3.4.1.1	Read Renewable Energy Credit Meter	AMI Network Management System	Read Renewable Energy Credit Meter	AMI Network Management System requests a meter read from the AMI Renewable Energy Credit Meter.	AMI Network Management System	AMI Renewable Energy Credit Meter	AMI Renewable Energy Credit Meter Read Request		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environment
3.4.1.2	AMI Renewable Energy Credit Meter Data to AMI Network Management System	AMI Renewable Energy Credit Meter	AMI Renewable Energy Credit Meter Data to AMI Network Management System	AMI Renewable Energy Credit Meter delivers AMI Renewable Energy Credit Meter Data to the AMI Network Management System	AMI Renewable Energy Credit Meter	AMI Network Management System	AMI Renewable Energy Credit Meter Data		
3.4.1.3	AMI Renewable Energy Credit Meter Data to Meter Data Management System	Meter Data Management System	AMI Renewable Energy Credit Meter Data to Meter Data Management System	The Meter Data Management System receives the AMI Renewable Energy Credit Meter Data from the AMI Network Management System	AMI Renewable Energy Credit Meter	Meter Data Management System	AMI Renewable Energy Credit Meter Data		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.5	Distribution Operator Contacted with Customer Inverter Information	PV Program Manager	Distribution Operator Contacted with Customer Inverter Information	PV Program Manager contacts the Distribution Operator with the Customer Inverter Information.	PV Program Manager	Distribution Operator	Customer Inverter Information		
3.6	Distribution Operator and the Distribution Management System	Distribution Operator	Distribution Operator and the Distribution Management System	The Distribution Operator uses the Distribution Management System to send Communication Request for the Customer Inverter.	Distribution Operator	Distribution Management System	Communication Request for the Customer Inverter	Establishing remote 2-way communications with the Customer Inverter.	

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.5.1	Distribution Management System Sends Communications to the AMI Network Management System	Distribution Management System	Distribution Management System Sends Communications to the AMI Network Management System	The Distribution Management System sends Communication Request for the Customer Inverter to the AMI Network Management System	Distribution Management System	AMI Network Management System	Communication Request for the Customer Inverter		
3.5.2	AMI Premise Interface Receives Communications Request	AMI Network Management System	AMI Premise Interface Receives Communications Request	The AMI Network Management System Communication Request for the Customer Inverter to the AMI Premise Interface via the AMI Infrastructure.	AMI Network Management System	AMI Premise Interface	Communication Request for the Customer Inverter		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.5.3	Customer Inverter Receives Communications Request	AMI Premise Interface	Customer Inverter Receives Communications Request	The AMI Premise Interface sends Communication Request for the Customer Inverter to the Customer Inverter.	AMI Premise Interface	Customer Inverter	Communication Request for the Customer Inverter		
3.5.4	Process Communications Request	Customer Inverter	Process Communications Request	Customer Inverter processes and acts (if necessary) upon the Communication Request for the Customer Inverter from the Distribution Management System	Distribution Management System	Customer Inverter	Communication Request for the Customer Inverter		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.5.5	Communications Acknowledgement to the AMI Premise Interface	Customer Inverter	Communications Acknowledgement to the AMI Premise Interface	The Customer Inverter sends Communications Acknowledgement Signal to the AMI Premise Interface.	Customer Inverter	AMI Premise Interface	Communications Acknowledgement Signal		
3.5.6	Communications Acknowledgement to the AMI Network Management System	AMI Premise Interface	Communications Acknowledgement to the AMI Network Management System	The AMI Premise Interface sends Communications Acknowledgement Signal to the AMI Network Management System	AMI Premise Interface	AMI Network Management System	Communications Acknowledgement Signal		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.5.7	Communications Acknowledgement to the Distribution Management System	AMI Network Management System	Communications Acknowledgement to the Distribution Management System	The AMI Network Management System sends a communication acknowledgement signal to the Distribution Management System	AMI Network Management System	Distribution Management System	Communications Acknowledgement Signal		
3.6	General Query to Update System Equipment Information	Distribution Management System	General Query to Update System Equipment Information	The Distribution Management System on a periodic basis performs a General Query to update system equipment information.(This updates the Outage Management System and/or Grid Control Center and/or Distribution Management System on any new Customer Distributed Generation equipment parameters/data and AMI Renewable Energy Credit Meter Data).	Distribution Management System	Distribution Management System	General Query to Update System Equipment Information		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.7	Acknowledgement of Successful Communications	Distribution Operator	Acknowledgement of Successful Communications	The Distribution Operator acknowledges the successful Communications Acknowledgement Signal from the Distribution Management System	Distribution Operator	Distribution Management System	Communications Acknowledgement Signal		
3.8	Successful Communications	Distribution Operator	Successful Communications	The Distribution Operator notifies the PV Program Manager of the successful Communications Acknowledgement Signal with the Customer Inverter.	Distribution Operator	PV Program Manager	Successful Communications		
3.9	Enter Customer Account Information	PV Program Manager	Enter Customer Account Information	PV Program Provider enters the Customer Account Information into the Customer Information Service.	PV Program Manager	Customer Information System	Customer Account Information		

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECS A Environments
3.10	Customer receives O.K.	PV Program Manager	Customer receives O.K.	PV Program Manager notifies Customer that it is OK to begin generation.	PV Program Manager	Customer	OK to begin generation		

2.3.3 Post-conditions and Significant Results

<i>Actor/Activity</i>	<i>Post-conditions Description and Results</i>
Customer	Customer may now generate energy for their own use or to be supplied to the grid with their PV installation. The Customer may be able to sign up for additional solar programs from the Utility that could be financially beneficial to the Customer.
The Utility	The Utility can remotely monitor the output from the Customer PV Installation. This will enable the Utility to more accurately view the performance of the Distributed Generation installations on the Utility's grid.

<i>Actor/Activity</i>	<i>Post-conditions Description and Results</i>
The Utility	The Installation of the two-way communicating Customer Inverter will allow the Distribution Operator to have a greater view of the system and the capability to impact the system to a greater degree.

2.4 Architectural Issues in Interactions

Elaborate on all architectural issues in each of the steps outlined in each of the sequences above. Reference the Step by number. Double click on the embedded excel file – record the changes and save the excel file (this updates the embedded attachment).



"DomainTemplate -
Architectural Issues.x

2.5 Diagram

3 Auxiliary Issues

3.1 References and contacts

ID	Title or contact	Reference or contact information
[1]	ANSI C84.1-1995 Electrical Power Systems and Equipment – Voltage Ratings (60HZ0	ANSI A and ANSI B Voltage Requirements
[2]		

3.2 Common Terms and Definitions

ID	Term	Definition
[1]	Feeder Penetration	<p>PV penetration is the rated capacity (KW) of the aggregated generation, including the proposed Generating Facility compared to the annual peak load (KW) as most recently measured at the substation or calculated for that portion of a public utility’s electric system connected to a Customer bounded by automatic sectionalizing devices or the end of the distribution line.</p> <p>Units are % of peak on the feeder or portion of a public utility’s electric system</p> <p>In Manuel’s discussions with the state, “Distributed Generation will be viewed by the rating of devices at point of common coupling.”</p>
[2]	AMI	<p>Advanced Metering Infrastructure. “AMI” for the Utility for this project- refers to systems that measure, collect and analyze energy usage, and send information to the Customer through advanced electricity meters, via various communication media on request or on a pre-defined schedule. This infrastructure includes advanced electrical meters, communications, and Meter Data Management software. The communication between the end use energy consumer and the utility is two way communications. The AMI</p>

		infrastructure and communications for the purposes of this project ends at the meter, which provides a Premise Interface to the Inverter or possibly the Home Area Network.
[3]	AMI Premise Interface	The Premise Interface is one of the communications radios “under glass” of the AMI Meter. (There are two radios built in to the AMI Meter. One is for the AMI System and is a longer range radio. The other is for the Premise Interface and it has a smaller range.) This interfaces to the Customer Inverter and the Home Area Network (if available).
[4]	Home Area Network	Any Customer side automation that can make use of utility signals to affect energy usage within the premises will be considered as the Home Area Network for this project. Home Area Network can affect DER, lighting, security, etc. The Utility will not own Home Area Network.
[5]	Smart Grid	The Utility’s perspective is that the “smart grid” is a grid that integrates the electrical grid with communications/ automation with a fully integrated IT infrastructure to enhance reliability, involve the consumer, and integrate distributed resources. It is the seamless integration of the electric network, a communications network, and all the necessary software and hardware to monitor, control and manage the creation, distribution, storage and consumption of energy by any Customer type. The smart grid of the future needs to be interactive, distributed, and extended to any consuming device.
[6]	Real Time Pricing (RTP) Model	An electricity pricing methodology that enables automatic Customer load response based on a pre-defined price matrix in response to a utility signal for hourly pricing.
[7]	Distributed Generation (DG) and Distributed Energy Resource (DER)	For this project Distributed Generation (DG) will be defined as utility or Customer provided photovoltaic generation or storage connected at the distribution voltage level (12.47kV) or service voltage level. Distributed Energy Resources (DER) on the other hand will include all DG and demand response capability through the Home Area Network.
[8]	Electrical Storage	The definition for storage for this project will be considered electrical storage (providing a way to add electrons to the grid). Alternate Scenario (and UC-3 – DR): The definition for storage for this project will be electrical storage along with thermal storage (building envelop/thermal storage) and demand response techniques aligned with commercial and residential cooling and refrigeration systems in addition to innovative approaches to demand response aligned with data center energy consumption.

3.3 Action Item List

ID	Description	Status
[1]		
[2]		

3.4 Revision History

No	Date	Author	Description
1.1	8-11-09	Brian D. Green	Draft for Review
1.2	8-13-09	Brian D. Green	Update Equipment Interfaces
1.3	9-15-09	Ron Pasquarelli	Revise formatting and content for new IntelliGrid template
1.4	9-22-09	Brian D. Green	Update numbering and Information Exchanges
1.5	9-26-09	Brian D. Green	Update numbering and Information Exchanges
1.6	9-27-09	Ron Pasquarelli	Cleanup
1.7	10-2-09	Ron Pasquarelli	Cleanup – add actor Utility and cleanup policies
1.8	10-06-09	Brian D. Green	Cleanup Actors
1.9	12-15-09	Brian D. Green	Make the document generic and ready for posting on EPRI’s Smart Grid Use Case Repository.

